Air quality modelling in the Belluno Valley

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A three dimensional eulerian model with photochemical module has been implemented in the Belluno Valley in order to air quality assessment. Such a complicated and expensive instrument, both for computing time and input files preparation, has been chosen because air quality assessment needs such a model in order to simulate not only pollutants' transport and diffusion, but chemical processes too, being investigated primary and secondary pollutants.
The modelling suite that has been used is ARIA Regional from Arianet srl, with numerical codes for input pre-processing, user-selected pollutants' transport, diffusion and chemical reactions simulation, model output post-processing.
Model inputs are emissions data base collected via a bottom up approach, performed in the VIQA project contest and containing punctual, linear and diffuse emissions on the whole domain; the meteorological data, consisting in hourly measures of Meteorological Centre of Teolo and Avalanche Centre of Arabba stations; sodar and radiometer data; Udine (Campoformido) raob sounding data.
Meteorological data have then been interpolated and elaborated through a diagnostic model (Minerve), providing three-dimensional input fields for the dispersion model FARM.
Four monthly runs have then been performed with FARM, in order to simulate one month for season: February, May, July and October.
Comparisons with experimental data have been presented for the most critical pollutants between those monitored by the air quality network of ARPAV Belluno Department: PM10, NOx and ozone. In any case the comparison with experimental measures has been performed for all the pollutants.
A good agreement is shown between measures and model output, especially for NOx, NO, NO2. Also PM10 are often well reproduced, but in winter time, the most critical period for limit value exceedings, the model fails in peaks reproduction, though concentrations trend is maintained. To conclude, ozone daily averages are well simulated, even if maxima and minima are not completely reproduced. This is probably due to lower resolution in boundary conditions.
In order to improve PM10 simulation an attempt on input meteo data has been made. The diagnostic module Minerve has been substituted by three-dimensional data from a prognostic model called COSMO-LAMI with 7x7 km resolution, belonging to Swiss Meteorological Body. Only one test run has been done, on the most critical month: February. Concentrations trends are comparable with those of the run with meteo data from Minerve, even if higher wind velocities in COSMO cause lower concentrations in PM10.
Our next step will be verify if the 2x2 km version of COSMO-LAMI allows ground wind fields to be closer to measures; otherwise we could study a joint methodology using COSMO –LAMI data for the vertical structure and CMT and CVA data for the ground field, appropriately merged.